Earth Surface Processes and Landforms
Earth Surf. Process. Landforms **24**, 661–662 (1999)

BOOK REVIEWS

THE SCIENTIFIC NATURE OF GEOMORPHOLOGY edited by Bruce L. Rhoads and Colin E. Thorn, John Wiley, Chichester 1996. No. of pages: xi + 481. Price: £65·00 (hb). ISBN 0-471-96811-0

This volume constitutes the Proceedings of the *27th Binghamton Symposium in Geomorphology,* held in Urbana, Illinois, 27–29 September 1996. It comprises 18 chapters, and is divided into four parts, providing philosophical and methodological foundations for the discipline, substantive reviews of research prospects and practice, and historical commentary.

'Philosophical Issues' (Chapters 1–5) begins with a concise and authoritative review of post-positivist 20th century science. Written by a practising philosopher (Harold Brown), it provides a refreshing break from physics as the paradigmatic science, and emphasizes that the evaluation and evolution of methodology are part of the process by which science progresses: scientists have to learn how to learn. Rather unexpectedly, it is left to Chapter 5 before the editors make the case for the importance of the philosophy of science within geomorphology, despite their forceful comments in the Preface, that current tendencies towards disciplinary fragmentation, are, in part, reinforced by a failure to engage with methodological and philosophical underpinnings of the subject.

Chapters 2 (Rhoads and Thorn) and 3 (Baker) are essentially historical. First, the work of Gilbert and Davis is used to illustrate the theory-laden nature of observation in geomorphology. Next, via an examination of the philosophy and history of geology, geomorphology is presented as a discipline emerging from a descriptive and experimental stage, to one of emergent theory where mathematics is used to disclose new phenomena. Chapter 4, 'Fashion in Geomorphology' (Sherman), is the most entertaining and provocative contribution to the volume. This treats disciplinary configurations and practices as overtly social. Having identified geomorphology as 'philosophically sedate' (and with some compelling side-swipes at the absurdities of applying rigid methodological/historical analyses), Sherman proceeds at breakneck pace to introduce us to some past and present 'fashion dudes'–the great figures of the discipline–before mischievously ending with a vision of the contemporary research community in need of rejuvenated leadership, and with forewarnings of an inevitable struggle for power.

'Methodological Issues' (Chapters 6–9) is fronted by contributions from Church and Richards. These are the methodologically substantive centrepieces of the volume, and bring to mind Simpson's (1963) essay in Albritton's *The Fabric of Geology* (a favourable comparison can, in fact, be made with this entire volume). Both authors are concerned with the interplay between evolving methodology and the associated increase in knowledge. Church examines scale-determined explanation. Whereas in the past, predictive success has depended upon the emergence of contingency, rather than the recurrence of scaled-up mechanistic events, numerical models (see also Kirkby, Chapter 10), and perhaps also innovative measurement devices at the laboratory scale (Peakall *et al.,* Chapter 9), now allow more phenomena to be apprehended (that is, explained) by physical mechanism. This new explanatory power is likely to be part of a shift in attention, as identified by Richards, from functionalist, large-N (extensive) to realist, small-N (intensive) research designs. Exploration of the theoretical reasoning necessary for generalization from the latter is not, however, complete and is one future direction for the discipline (and one element of the power struggle envisaged by Sherman!).

As for disciplinary direction, several possibilities are outlined in the succeeding section, 'Modeling: Prospects and Problems' (Chapters 10–14). Despite the general proposition that conceptual models provide a bridge between observation and prediction over a variety of scales (Kirkby), cautionary notes from Dorn, concerning the resolution of geomorphological evidence and correlations with environmental events, and from Lawrence, on the effects of threshold processes in modelling, are, however, difficult to overlook. In contrast, Beven presents an imaginative and upbeat prospect for harnessing unavoidable uncertainties in modelling (the latest recasting of the equifinality issue) as a stimulus for creative experimentation. What is also required to achieve explanatory success is a kind of 'emergent scale' vocabulary together with analytical techniques appropriate for environmental explanation. These need to be distinct both from the basic mathematics illustrative of the emergence of chaos and complexity in simple non-linear systems (Phillips), and from the results of scaled-up laboratory studies (Haff).

The final section, 'Interdisciplinary and Intradisciplinary Contexts' (Chapters 15–18), begins with a somewhat depressing picture of a divided geomorphology, beleaguered by an uneasy juxtaposition of geological and

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CCC 0197-9337/99/070661–02 $17.50

geographical traditions (Twidale). This duality has led to a 'composite science' which can, according to Osterkamp and Hupp, at best develop a unified perspective, rather than a unified theoretical approach. Bauer, however, is more optimistic, and can see benefits in both traditions. The *geographical* context for a distinctly applied geomorphology, based jointly upon policy, social concern and sound scientific explanation, is persuasively presented by Graf in the concluding chapter.

Approaching the start of a new millennium, it is perhaps inevitable that reviewers feel compelled to identify disciplinary milestones and benchmark publications. Nevertheless, looking back over more than a century of geomorphological science, this volume will stand out as a worthy candidate for such an accolade. The editors are to be congratulated for a work which should be read by all engaged in research into, and teaching of, the scientific explanation of Earth surface processes and landforms.

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LANDFORM MONITORING, MODELLING AND ANALYSIS edited by S. Lane, K. Richards and J. Chandler. John Wiley, Chichester 1998. No. of pages: 454. Price: £65·00. ISBN 0 471 969 77 X.

This interesting volume is the result of a British Geomorphological Research Group conference held in Cambridge in 1995 as a natural sequel to *Spatial Analysis in Geomorphology,* which was edited for the BGRG in 1972. The present editors have undertaken in their Chapter 1 an excellent analysis of spatial landform research in the intervening quarter of a century. They conclude that the major difference between the contents of the two volumes is 'the physico-mathematical basis of a large proportion of the terrain-based modelling' in the latter. In this respect it is interesting to refer to the only chapter in the present volume which was written by a contributor to the earlier one, namely 'What do terrain statistics really mean?' (Chapter 6) by Evans. The latter, a dedicated morphometric researcher, feels that although the 1972 volume concentrated too much on the study of form for its own sake, current spatial geomorphology has in turn concentrated too much on studies of process, and argues that the core of the discipline should consist of a more balanced interaction between the two.

In their introductory chapter the editors identify particular areas of current research which are highlighted in the present volume. The first are technical developments, which include the electronic tacheometer (Chapter 2), the Global Positioning System (Chapters 2 and 3), Geographical Information Systems (Chapters 7,8 and 11) and photogrammetry (Chapters 2, 4 and 9). The second are a range of conceptual isues in terrain modelling, which include those concerned with the quality of data representing the terrain surface (Chapters 4, 5, 6, 7, 13 and 14); difficulties of treating larger-scale landforms over longer periods of time (Chapters 11 and 14); the use of topography to provide process information (Chapters 10, 12 and 13); and the estimation of process rates from changes of form associated with hydrological systems (Chapters 10 and 12), glacier mass balance (Chapter 15), snow cover (Chapters 16 and 17) and coasts and estuaries (Chapters 18 and 19). Chapter 12, where Lamb *et al.* employ TOPMODEL (incidentally I felt that the overall contribution by Kirkby over many years should have been highlighted more in the work as a whole), Chapter 13 by Bates *et al.* on model stability, resolution and sensitivity, and Chapter 14 by Lane on the modelling of a dynamic river channel system, were for me the most interesting core of the book. However, there is something significant here for everyone who is interested in spatial modelling.

If this book tells us anything about developments over the past 25 years it has to do with the nature of research. In 1972, 17 authors were involved in producing 14 chapters (an average of 1·2 authors per chapter), whereas in 1998, 47 contributors produced 19 chapters (2·4 authors per chapter). This clearly points to the growth of scholarly interest in the field, and to the growing importance of collaborative research within an increasingly specialized and fragmented area of scholarship.

Books of this kind inevitably turn out to be 'curate's eggs' to some degree, and the least satisfactory ones may even graduate into 'dogs' dinners'. However, it is pleasant to report that the present work holds together well and maintains the central theme. Problems of the integration of form and process studies and of the natural preoccupation with small scales of space and time remain but, more importantly, are being recognized. The book is a mine of information and represents a significant vantage point from which to view both past and future developments in this rapidly growing field. The fact that the former has been accomplished more satisfactorily than the latter is not surprising, as is recognized by the editors, who wrote: 'it would have required some prescience in 1972 to have predicted the intervening quarter of a century'. To predict the work of the next quarter of a century would give a latter-day Nostradamus quite a headache.

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